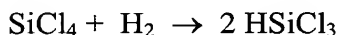


REMARKS

35 U.S.C. §102(b)

The Office rejected Claims 1-3, 5, 14-15, 17, 21-22, 27 and 29-30 as anticipated by Yamanaka (U.S. 6,653,212) citing to DeLuca (U.S. 5,910,295) or Rodgers (U.S. 3,933,985) as evidence of inherency. The Office appears to take the position that Yamanaka's use of SiCl₄ in combination with hydrogen carrier gas necessarily forms HSiCl₃ in a hydrodehalogenation reaction. The Office concedes that Yamanaka does not explicitly disclose the formation of HSiCl₃ and thus relies on DeLuca and Rodgers as evidence that HSiCl₃ would necessarily form in the Yamanaka process.

The hydrodehalogenation reaction shown below requires the use of a reactive hydrogen gas:



It is a matter of fact that the hydrogen gas used in the Yamanaka process is an inert (i.e., non-reactive) material. Yamanaka discloses the following in this regard:

The relationships between the formed metal thin films and the material gases (reaction gases) are as follows. Note that, as the carrier gas, preferably use is made of an inert gas such as He, H₂, Ar, or N₂.

See column 48, lines 48-52 of Yamanaka.

The Office appears to interpret the above-quoted disclosure as evidence that hydrogen may be used as either an inert gas or a reactive gas in the Yamanaka process. Such an interpretation is in contradiction with the explicit Yamanaka disclosure; namely, Yamanaka describes reactive gases, e.g., reaction gases, as "material gases" not as carrier gases and not as inert gases. The Office's assertion that the hydrogen in the Yamanaka process is reactive is inconsistent and not supportable in view of Yamanaka's explicit disclosure.

The Office's assertion that Yamanaka inherently describes a process in which SiCl₄ inherently reacts with hydrogen to form HSiCl₃ in a hydrodehalogenation reaction is

therefore not supportable in view of Yamanaka's explicit description of hydrogen as an inert carrier gas.

DeLuca's disclosure of a process whereby SiCl_4 is reacted with H_2 and Si is immaterial and irrelevant to the Office's inherency argument. The hydrochlorination reaction, i.e., $3\text{SiCl}_4 + 2\text{H}_2 + \text{Si} \rightarrow 4\text{HSiCl}_3$, is contradictory to the Office's assertion of inherency. Looking only at the aforementioned hydrochlorination reaction it is evident that hydrogen participates and is incorporated in HSiCl_3 . In this capacity hydrogen cannot be considered to be an inert carrier gas. The Office's assertion to the contrary are not supportable as a matter of fact.

The Office alternately cites to column 9, lines 12-16 and column 16, lines 9-13 of Yamanaka as evidence of inherency. The disclosure at both citations is identical and reproduced below for convenience:

Note that catalytic CVD is a method for activating and ionizing at least one part of a material by a catalytic reaction where a thermal decomposition reaction for the thermal catalyst heated to less than the melting point and depositing these deposition seeds on a heated substrate.

The above-quoted disclosure appears to have no relevance to the description of a process for forming HSiCl_3 from SiCl_4 and H_2 . Likewise, the above-quoted disclosure appears to have no relevance to the determination whether hydrogen is inert or reactive in the Yamanaka process.

In the alternate to relying on DeLuca as evidence of inherency, the Office cites to Rodgers. As already pointed out in the Amendment filed on May 4, 2010, the Rodgers patent describes a process in which the formation of silicon is desirably avoided. This contradictory disclosure is reproduced below for convenience:

Care must be taken in operation of the process in accordance with the invention to prevent deposition of silicon within the reaction furnace 14 since the silicon acts as a catalyst or nucleating agent in favor of reaction (1) rather than in favor of

the formation of trichlorosilane (reaction 2), as is desired. To avoid formation of any silicon in the reaction furnace, it is therefore desirable that a minimum 5% silicon tetrachloride be maintained in the feed to the reaction chamber, and as shall be shown, a preferred feed contains approximately 50% silicon tetrachloride.

See column 3, lines 32-37 of Rodgers.

The Yamanaka and Rodgers processes are carried out at conditions so different from one another that the very purposes of the respective process is contradictory. Yamanaka describes a process in which Si is deposited whereas Rodgers describes a process in which the formation of Si is prevented. The Office's assertion that Rodgers provides evidence that certain reaction processes inherently occur in the Yamanaka process is unsupported in view of the fact that the respective processes are opposites of one another, i.e., one process is used to deposit Si whereas the other process prevents the deposition of Si.

In defense of Rodgers the Office asserts that Figure 2 of the Rodgers patent is evidence of inherency. The Office's assertion in this regard is likewise unsupported. Figure 2, at best, describes a process in which SiHCl_3 and H_2 are mixed and reacted. The Office fails to explain how the disclosure of Figure 2 is in any way relevant to the dehydrohalogenation of SiCl_4 .

For the reasons discussed above in detail, Applicants submit that the rejection of the claims as anticipated by Yamanaka are not supportable and should be withdrawn.

Rejection Under 35 U.S.C. §103 over Yamanaka in Combination with DeLuca and Rodgers

In the alternate to anticipation the Office asserts that the claims are obvious over Yamanaka in combination with DeLuca and Rodgers. The Office incorporates in its argument that the DeLuca and Rodgers patents prove that HSiCl_3 is inherently formed in the Yamanaka process. As explained above in the traversal to the anticipation rejection, the Office's assertion in this respect is not supportable.

In the absence of any evidence that the Yamanaka process forms HSiCl_3 , Yamanaka, alone cannot render the presently claimed invention obvious.

Further, the Office provides no reason why those of skill in the art would wish to modify the Yamanaka process such that HSiCl_3 is formed. In fact, the Yamanaka process forms a Si thin film, i.e., a solid surface on a substrate. There is no conceivable reason why one of skill in the art would wish to modify the Yamanaka process to form a HSiCl_3 on the Yamanaka substrate.

Further still, given the fact that the Yamanaka process is carried out in a vacuum, Applicants submit it makes absolutely no sense whatsoever to modify Yamanaka to form HSiCl_3 because this material is gaseous under the vacuum chamber high temperature conditions of the Yamanaka process.

The rejection of the claims as obvious over Yamanaka in combination with Rodgers and/or DeLuca is thus not supportable and Applicants respectfully request withdrawal of the rejection.

Applicants submit that Claims 19 and 20 are further patentable over Yamanaka in combination with DeLuca and/or Rodgers. Each of Claims 19 and 20 recite a pressure that is substantially greater than the vacuum conditions described in the Yamanaka patent. For example, Claim 19 recites a pressure of 1-10 bar whereas Claim 20 recites a pressure of 1.5-10 bar. It is readily evident that a pressure of 1 bar is equivalent to 1 atm or 760 torr pressure and that such a pressure cannot be reasonably interpreted to represent the pressure inside a vacuum chamber during the Yamanaka CVD process.

The processes of Claims 19 and 20 are thus exclusive of the vacuum-based processes of Yamanaka and should be found further not obvious over the cited art.

Rejection of the Claims as Obvious over JP '017 in Combination with Yamanaka, Roewer (U.S. 5,716,590) and Rodgers

As explained above, Applicants submit that it would make no sense to modify the Yamanaka process to form HSiCl_3 , especially not in the amounts and under the conditions recited in Claims 12, 19-20 and 28 in which HSiCl_3 is isolated and/or at least partially condensed or is made under conditions that are contradictory to a vacuum. Thus, the Office's assertion that those of skill in the art would modify the JP '017 process in the manner of Yamanaka is not supportable and the rejection of at least Claims 12, 19-20 and 28 as obvious over JP '017 should be withdrawn.

Moreover, there is a substantial difference between the process of the present claims and the process described in the JP '017 reference; namely, the present claims require contacting a gaseous feed mixture of H_2 and SiCl_4 with a heating element made from one or more of the metal materials explicitly recited in the claims. JP '017, in contrast, describes a process in which a reaction mixture is contacted with a *graphite heating element*. Graphite is not the metal of the present claims and is not suggestive of the metal of the present claims. In order for one of skill in the art to be motivated to use any metal heating element described in the Yamanaka patent in place of the graphite heating element of JP '017, there must be some basis to do so. Given the substantial difference in processing conditions and effects of the respective JP '017 and Yamanaka processes, no motivation, expectation of success or basis for combining the references exists.

In the alternative to citing Yamanaka, the Office cites to Roewer as evidence that it would be obvious to use a metal heating element in the JP '017 process. Roewer does not, however, describe contacting a SiCl_4/H_2 -containing mixture with a metal heating element. Instead, Roewer describes a catalytic dehalogenation or hydrodehalogenation reaction that includes contacting a reaction mixture with "a finely-dispersed catalytic active material

which comprises silicon and at least one transition metal” (see the Abstract of Roewer). The catalytically active material of Roewer is not a metal but instead is a mixture of silicon and a metal element. This distinction is especially relevant with respect to the subject matter of, for example, Claim 21 in which the heating element “consists of the metal material”.

The catalytically active material of Roewer is in violation of this requirement of Claim 21 because the presence of silicon is required and thus should be found separately patentable over the cited art.

35 U.S.C. 112

The Office rejected Claims 27 and 28 as failing to comply with the written description requirement. The Office takes the position that the as-filed disclosure does not describe an embodiment of the invention in which a catalytic hydrodehalogenation of SiCl_4 forms a product mixture that includes HSiCl_3 and HCl . Applicants draw the Office’s attention to the description of hydrodehalogenation throughout the original specification. In particular, Applicants draw the Office’s attention to page 6, lines 11-15 which describes the use of a “defined mixture of hydrogen and silicon tetrachloride...to carry out the process of the invention” (i.e., hydrodehalogenation of SiCl_4 to form HSiCl_3). The reactor in which the process of the invention is carried out is described to be “resistant to silicon tetrachloride and HCl ...”.

Applicants submit that the specification as a whole and, in particular, the disclosure at page 6, lines 11-15 of the specification make it clear that at the time the present application was filed Applicants were in possession of an invention in which the hydrodehalogenation of silicon tetrachloride forms HCl and HSiCl_3 .

The Office’s reference to a theoretical process in which silicon may be present is immaterial and irrelevant to the determination whether the subject matter of Claims 27 and 28

was described in the as-filed disclosure in a manner such that those of skill in the art would recognize that Applicants were in possession of the claimed invention.

The Office rejected Claims 1-17, 19-23, and 26-30 for indefiniteness. The Office appears to be taking the position that the claims are indefinite because the claimed process may include a step of further reacting HSiCl_3 . The Office appears to believe that the presence of an additional step would be in violation of the preamble of the claims which describes a process for the catalytic hydrodehalogenation of SiCl_4 to form HSiCl_3 .


Irrespective of whether the claimed process includes one or more additional steps in which HSiCl_3 is converted to a different product, the claimed invention explicitly recites and requires inclusion of the formation of HSiCl_3 . The Office's rejection of the claims for indefiniteness is unsupportable both legally and factually.

Applicants respectfully request withdrawal of the rejection under 35 U.S.C. §112.

Applicants thus respectfully request withdrawal of the rejections and the allowance of all now-pending claims.

Respectfully submitted,

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